

Self-assembled quantum-dot lasers and semiconductor optical amplifiers

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Abstract

Through the research of quantum dot lasers, we have obtained significant knowledge on carrier dynamics and optical gain of quantum dots like homogeneous broadening of single-dot optical gain and its effect on lasing spectra, the magnitude of gain as a function of current, ultrafast gain recovery, and a comprehensive theory. Based on the knowledge, we developed an operation theory of traveling-type quantum-dot semiconductor optical amplifiers (SOAs) to demonstrate that they can process high-bit-rate multiple-wavelength optical signals over 40 Gbit/s under gain saturation. This promises diverse optical functional devices, which meet with the demand of the next-generation broadband all-optical photonic networks.